AMENDMENTS TO THE SPECIFICATION

Please amend the specific numbered paragraphs (as originally filed) as indicated:

[0004] Typical prior art dampers of the type for which improvements are shown by this invention consist of a frame which is secured inline in a duct carrying combustion ~~by~~ <u>by-products.</u> A blade typically slides into the cross sectional area of the duct from an area outside of the duct to close the duct, thereby interrupting the flow of the combustion by-products past the damper. In addition, to better seal the duct against leaks of the combustion by-products past the damper blade, a seal within the damper contacts the blade and is forced against the blade by an inflation pressure provided by compressed air which may be inserted into a hollow area of the seal. To open the damper it is known in the art to evacuate the air from within the seal to cause the seal to collapse away from the blade, thereby allowing the blade to be retracted to open the duct.

[0005] Such a damper is shown in U.S. Pat. No. 4,561,472 (Dryer et al.). The damper of the '472 patent is typical of those shown in the many patents of the prior art and improvements thereto are disclosed by this invention. Other similar dampers are also shown in ~~U.S.N o.~~ <u>U.S. Patent No.</u> 4,235,256 (Crawshay), U.S. Pat. No. 4,163,458 (Bachmann) and U.S. Pat. No. 4,022,241 (Fox).

[0006] One problem with the damper disclosed by Dryer et al. is that a failure of the seal may be precipitated by a failure of the compressed air system, which may allow the seal to deflate, thereby allowing combustion by-products to [[a]] leak around the blade. A further problem with the prior art dampers of the type disclosed by Dryer et al. is that the blade, which may be subjected to differential pressure gradients and be relatively heavy, on the order of 4 plus tons, may contact the seal cartridge frame during retraction and engagement, causing galling to develop between the blade and the seal cartridge frame. This is particularly troublesome in corrosive environments where alloy materials must be utilized. Further, the mechanism for raising and lowering the blade in

the prior art systems is prone to fouling by the collection of dust and dirt and through corrosion of the mechanism by continued exposure to the corrosive elements present in the combustion by-products. Lastly, the flexible seals of the prior art are typically permanently affixed to the frame of the damper, making it difficult to repair or replace the seal when necessary. These and other problems with the prior art are addressed by the current invention.

[0009] In one improvement over the prior art, the opposing edges of the blade parallel to the direction of movement are formed into a rack system consisting of a toothed edge. The toothed edges of the blade plate engage with specially designed pinion wheels to impart a linear force to the blade plate thereby causing it to translate into and out of the area within the frame to open and close the damper, depending upon the direction of rotation of the pinion wheels. The invention employs circular pinions fabricated of pinion wheel sides fixated with a plurality of pinion pins. The pinion wheel sides also act as a guide for the blade plate as it ~~translated~~ translates into and out of the duct. The blade plate edges are each cut as a linear rack of a shape and dimension such that any thermal expansion of the blade is accommodated. The engagement of the pinion wheels with the blade is self-cleaning and virtually maintenance free. The use of pinion pins is an improvement over pinion gears in that solid matter and effects of corrosion do not deteriorate performance of the drive over time.

[0023] FIG. 12 is a side cross section view of the damper having the blade plate in the ~~closed~~ open position.

[0024] FIG. 13 is a side cross section view of the damper having the blade plate in the ~~open~~ closed position.

[0026] The damper 1 of the present invention is shown in detail in Figure [[1]] 2 and *in situ* installed in duct 2 in Figure [[2]] 1. Damper 1 consists essentially of frame 10, having a lower section 5, as shown in Figure 6, disposed within the cross sectional area

of attached duct 2, and an upper section 6, disposed adjacent to lower section 5 and outside of the cross sectional area of duct 2. In a normal installation, upper section 6 will be above lower section 5, but, in practice, there is no reason why upper section 6 cannot be disposed to the right, to the left, or below lower section 5. Frame 10 can be attached to duct 2 by any conventional means known in the prior art, such as through the use of bolts or folded flanges.

[0034] Pinion wheels 18 are shown in FIGS. 11a-c, and consist of pinion wheel sides 84 attached radially with pinion wheel hub 80. A plurality of pinion pins 82 are disposed between pinion wheel sides 84 at a point between pinion wheel hub [[18]] 80 and the outer radius of pinion wheel sides 84, and are held in place thereby. The actual number, size and spacing of pinion pins 82 may be varied without departing from the spirit of the invention, and is dependent upon, among other factors, the size and weight of blade plate 16. The spacing, size and frequency of slots 17 in the linear racks located along the sides of blade plate 16 must, of course, correspond with the frequency, size and shape of pinion pins 82 in pinion wheels 18. Additionally, hub 80 may be optional; pinion wheel sides 18 may be attached directly to the shaft of a motor or geared drive.

[0038] Seal cartridge 12 is shown in detail in Figures 4 and 5 and consists primarily of frame [[74]] 10 upon which is mounted seal membrane 70. Seal membrane 70 is composed, in the preferred embodiment, of a reinforced fluoroelastic material with reinforcing fibers oriented radially about the center of the seal. Fluoroelastomers (FKM) used in the preferred embodiment of the invention are of the type manufactured in the United States by Dupont Dow Elastomers, L.L.C. of Wilmington, Delaware under the trade name Viton® and by Dyneon, L.L.C of Oakdale, Minnesota under the trade name Fluorel®. FKM is often used as expansion joints in ducts. Preferably, the corners of seal membrane 70 are shaped as a quarter circle having a radius essentially compatible with the overall seal proportions. The reinforcing fibers in the seal membrane may be stainless steel, nickel alloy, fiberglass, polyester, Kevlar® or any other high-strength

material. In some instances, it may be preferable that the reinforcing material be a corrosion-resistant material.

[0039] Seal membrane 70 is attached to U-shaped flange 62 using bolts 68a and 68b as shown in the cross-sectional view of seal cartridge 12 in FIG. 4, thereby forming air chamber 65. Alternatively, welded studs may be used in place of bolts 68a and 68b to attach seal membrane 70 to U-shaped flange 62. Compressed air can be forced into air chamber 65 or evacuated from air chamber 65 via an air valve ~~19~~ (not shown) ~~in FIGS. 14 and 15~~. Seal membrane 70 is shown in its normal position in FIG. 4. This positioning of seal membrane 70 is assumed in the absence of negative air pressure within air chamber 65, that is, when compressed air is introduced into air chamber 65, or when there is a neutral air pressure in air chamber 65. As a result, the contact between seal membrane 70 and blade plate 16 will be maintained even in the event of a failure of the compressed air system, or in the event of a leak in air chamber 65. Reference number 72 in FIG. 4 shows the position of seal membrane 70 assumed when air chamber 65 is evacuated under negative air pressure. Position 72 of seal membrane 70 is assumed when blade plate 16 is translating from one position to another, to avoid contact between irregularities, rough surface areas or corrosion extant on blade plate 16 with seal membrane 70, thereby further prolonging the life of seal membrane 70.